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ABSTRACT

The results of a survey which sought to determine the science education research needs of elementary teachers are discussed in this report. The survey was intended to provide science education researchers with information on what research areas might be of greatest interest to elementary teachers. The sample consisted of 553 elementary teachers in 98 schools across the United States. Results of the study indicate that the top five research interests of teachers in order of preference are: hands-on experiences, science content of the curriculum, cognitive development and learning styles, problem solving, and teaching strategies. The area of lowest interest was research on sex differences. The survey instrument is included in the report. (ML)

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Science Education Research Interests of Elementary Teachers

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Science Education Research Interests of Elementary Teachers

ABSTRACT

Science education researchers have always sought to improve the quality of our nation's schools. One way of doing this is to make research findings on the teaching of science available to teachers. Perhaps an even more effective way is to plan research studies with teacher's interests in mind. The purpose of this study was to determine the science education research interests of elementary teachers and to examine the data according to certain demographic variables. The sample consisted of 553 elementary teachers in 98 schools from across the nation. The survey instrument contained 28 items, 16 of which were included on a survey instrument prepared by White et al. The data collected using the Likert-type questionnaire were dichotomized as "1" important and "0" not important and were analyzed using the Cochran Test and the McNemar Test for post hoc comparisons. Results of the study indicate that the top five research interests of teachers in the order of preference are: hands-on experiences, science content of the curriculum, cognitive development and learning styles, problem solving, and teaching strategies. The area of lowest interest was research on sex differences.

Results of the survey have several important implications for science education. First, they can be used to help science educators plan research that may be of interest to elementary teachers. Second, they can be used by groups such as NSTA who publish research reviews, and by colleges and universities that prepare elementary teachers, as a guide to not only what is of interest to elementary teachers, but to identify those areas of research for which dissemination has been lacking.

Introduction

Science educators have always sought to improve the quality of instruction in our nation's schools. The major focus of educational research has been the improvement of teaching and learning. Yet teachers frequently do not apply research findings to classroom practice. White, Yeany, DeTure, and Duea (1980) identified three barriers that prevent teachers from applying research findings to their teaching. Teachers perceive that the research is not relevant to their needs, the research is not communicated in a meaningful way, and inappropriate methods are used for dissemination of research findings.

Since 1978, the National Science Teachers Association (NSTA), cognizant of the problem, has tried to bridge the gap between theory and practice by including columns in each of its journal on research findings of interest to teachers. In addition, NSTA has created a monograph series entitled What Research Says to the Science Teacher. In 1983, the Research Committee of NSTA conducted a survey of the research needs of secondary teachers (Gabel, Helgeson, Novak, Butzow, and Samuel, 1985). During the 1984-85 school year, a similar survey was taken of the research needs of elementary teachers with regard to the teaching of science. The purpose for conducting both surveys was to determine those areas of research that teachers would like to see published in What Research Says to the Science Teacher, as well as informing the science education research community of the types of research that teachers would find most valuable.

Instrumentation

The instrument used for this study consisted of 28 items. Seventeen items had the same content as those which appeared on a similar instrument that had been prepared by White et al. (1980) but had never been administered to a large sample on the national level. The 17 items were obtained by consolidating responses that 108 elementary preservice teachers and classroom teachers made on a free response questionnaire. An additional 12 items were added to the survey by the NSTA Research Committee to reflect current topics of interest in science education. The Committee also removed one item because it was no longer relevant to elementary science teaching. Because the format of the original survey items was quite complex, items from the original survey were simplified to include a very short stem, and new items were written in this same style. This short stem which contained the research topic was illustrated with examples to give respondents a clearer conception of what each category included. Although the instrument was quite comprehensive because of the manner in which the original survey had been formulated, no claim is made that the survey contained all possible research topics. A facsimile of the survey instrument is shown in Figure 1. Items taken from the original instrument are marked with an asterisk. The alpha reliability of the instrument based on the responses of the entire sample was 0.80.

Insert Figure 1 about here.

In addition to containing the 28 items, the questionnaire also asked teachers to indicate the following information: sex, job description, grade levels taught during the 1984-85 school year, years of teaching experience, kind of community, number of science courses taken, number of weeks per year science is taught, and number of hours per week science is taught. At the end of the questionnaire, space was provided for teachers to add any other research topics that should be considered that would help them in their teaching.

Purpose

The major purpose for conducting the survey was to determine the science education research needs of elementary teachers. It was of interest to determine if these research needs differed according to the demographic data collected. The information obtained from the survey could be used to determine which topics would be of most interest to teachers and should appear in future volumes of What Research Says to the Science Teacher. Additionally, the survey would provide science education researchers with information on what research areas might be of greatest interest to elementary teachers. The following questions were addressed in the study:

1. What are the science education research priorities of elementary teachers in general?
2. Are there differences in priorities of elementary teachers according to sex?
3. Are there differences in priorities according to the grade level taught?
4. Are there differences in priorities according to teachers' years of experience?
5. Are there differences in priorities according to the kind of community in which the teacher is situated?
6. Are there differences in priorities according to the number of science courses taken?

7. Are there differences in priorities according to the number of weeks per year science is taught?
8. Are there differences in priorities according to the number of hours science is taught each week?

Procedures

A letter was mailed to 200 elementary school principals whose names were obtained from the registry of NSTA. This registry contains the names of approximately 600 principals across the nation who have expressed an interest in science and who have stated that science is being taught on a consistent basis in their schools. Principals were asked to supply either the names of teachers in their schools so that the questionnaires could be sent to each teacher or a list of the number of questionnaires needed if disclosure of names was prohibited in their school system. Fifty-eight principals responded to the first mailing which was sent out in late January, 1984 by sending the required names or number of questionnaires needed. Five others stated that they did not wish to participate in the study because of their involvement in other studies that year. A follow-up letter was sent to principals who did not respond to the first mailing one month later. This resulted in a response from an additional 40 principals bringing the total number of schools that participated in the study to 98 or 49% of the original sample.

The survey forms were sent to each school in one envelope and the principal was asked to distribute them to the teachers. Each teacher was provided a self-addressed stamped return envelope so that the questionnaire could be returned directly to the researchers to maintain confidentiality. The total number of survey forms sent to the schools was 1040 and of these, 592 or 57%

were returned. Data from 553 forms were analyzed for the study. In several instances, forms were eliminated because the person was an administrator rather than a teacher. In other instances data were very incomplete. Table 1 shows the distribution of the sample according to the demographic data. Various categories do not add up to 100% because in some instances teachers checked more than one item in a given category. In other instances, an item was left blank.

Insert Table 1 about here.

Findings

Data from questionnaires of this nature can be reported by means or frequencies. In the survey of secondary teachers, no major differences were found according to the method used (Gabel et al., 1985). Because the use of means in data analyses assumes interval data, and the data obtained from Likert-type scales used in the survey were not truly interval in nature, frequencies or percentages are used to report the findings.

The data collected using the Likert-type questionnaire were dichotomized as "1" important (1's and 2's on the scale) and "0" not important (3, 4, or 5 on the scale), thus producing two groups of responses whose frequencies could be compared. The data were then analyzed using the Cochran Test (Marascuilo and Mcsweeney, 1977) to determine whether all 28 research topics were equally important or whether there was a difference in elementary teachers' perceptions of the importance of the research topics. In

every case, differences significant at the 0.01 level were found in the 28 items when analyzed according to the demographic data.

In order to determine which topics were significantly different from one another within the 28 topics for each category, the McNemar test was used for these post hoc comparisons. Differences of significance between pairs of items/topics within the top ten selected as being important and within the lowest five selected as important were determined using this test. These are indicated on Tables 2-8 By vertical lines with horizontal extensions. The item where the vertical line begins is significantly different at least at the 0.05 level from other items indicated by horizontal lines extending from the vertical line. (The top ten items were selected because it was of interest to determine teachers' research priorities as well as the top items which were significantly different from others in the listing.)

Table 2 gives the research preferences of elementary teachers according to sex and for the total sample of teachers. Because

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Insert Table 2 about here.

88.2% of the teachers were female, the pattern for preferences of all teachers matches that of the female teachers quite well. (This high percentage of female teachers leads one to ask the question of whether this indicates that female teachers are more likely to return questionnaires or if the sample represents this proportion of female teachers in the population?) The areas of research of greatest interest to elementary teachers in general as shown in

column three was hands-on experiences (3) followed by science content of the curriculum (4). From the two vertical lines next to the 84.6% and the 80.9% it can be seen that the teachers' choice of these two topics differed significantly from other choices in the listing but not from each other. (Since in column 3 a vertical line begins at item 3 and the first horizontal line points toward item 1 at 74.1, this means that item 3 is not significantly different from item 4(no horizontal line) but is significantly different from item 1.) Other research topics of interest to teachers were cognitive development and learning styles (1), problem solving (11), and teaching strategies (12).

At the lower end of the scale item 24, research on sex differences was significantly different from the other low choices with only 21% of the sample perceiving this as a research interest. Other items that are toward the bottom of the scale but yet were selected by about 30% of the teachers as being important are misconceptions (13), science fairs (23), language difficulties (15), and role models and science careers (16).

Because the overall sample can be characterized as female (88.2%), with 16 or more years of experience (47.2%), from small towns (43.6%), who teach a full year of science (55.5%), for two to three hours per week (31.6%), these choices reflect this particular group of teachers. On the other hand, if one examines the choices of some subsets of the total sample, such as the male teachers, some differences are apparent. The most obvious difference is the lack of significant differences between the choices of items as indicated by the absence of vertical lines next to the percentages on the table. This is due to both less

divergence in male teachers' choices and because the sample size is considerably smaller (n = 62). Considering the results of the survey from the standpoint of significant differences, the research interests of male teachers are the same as those of their female counterparts even though the listing of these preferences is slightly different when they are ranked according to the percentage of persons selecting each item.

Table 3 shows the research interests of teachers according to grade taught. The sum of the teachers from the individual grades

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Insert Table 3 about here.

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as compared to the total differs by 78 indicating that a maximum of 78 taught at more than one grade level. At all grade levels interest in hands-on experiences (3) and science content of the curriculum (4) was high. These two items were included in the top three items at every grade level. A separate analysis of K-3 versus 4-6 (not shown) indicated that for the primary grades the interest in item 3 was significantly different from all other items. On the other hand, intermediate teachers selected item 4 as their primary interest although it was not significantly different from the next two choices, hands-on experiences (3) and problem solving (11).

Data were also analyzed for teacners according to the number of grade levels taught. It was thought that teachers who taught at three or more grade levels might be science specialists. Because only nine teachers fell into this category, it was impossible to make comparisons. Choices of teachers who taught at

two or more grade levels (n = 64) were analyzed separately from those teaching only one grade (not shown). The analysis showed that both groups of teachers selected the same top five items, although the order of the third, fourth, and fifth choices was slightly different.

Comparisons of teachers' research interests according to their teaching experience is shown in Table 4. The high percentage (47.2%) of teachers who returned the questionnaire had 16+ years of experience. Again, one must ask the question whether this percentage is high because less experienced teachers have a greater tendency not to answer questionnaires or whether this result is indicative of an aging population of teachers?

Insert Table 4 about here.

Table 4 shows that hands-on-experiences (3) was among the top two areas of interest for teachers of every level of experience. Science content of the curriculum was among the top two choices for all but the least experienced teachers where it was fourth, but not significantly different from their top four choices. Cognitive development and learning styles (1) and teaching strategies (12) appear to decrease in importance as teachers become more experienced. Item 21, interdisciplinary teaching of science and mathematics was rated fifth by teachers of one to five years of experience but failed to make the top ten of all other experience levels. Conversely, problem solving (11) is of lower interest to less experienced teachers than to more experienced ones. At the low end of the scale it is interesting to note that

teachers with less experience were more interested in research on sex differences than were more experienced teachers. Perhaps less experienced teachers are more aware of sex difference research from their recent instruction in college courses.

Table 5 shows teachers' research interests according to the type of locality in which they teach. A rural location was

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Insert Table 5 about here.

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defined as having a population of under 10,000; a small town as having a population between 10,000 and 75,000; a large town between 75,000 and 150,000; and a city as being over 150,000. Again for all types of localities, hands-on experiences (3) and science content of the curriculum (4) were among the top three choices. It is interesting to note that for teachers in large towns, problem solving (11) drops to seventh in the list of priorities and sequencing of science content (14) is third. At the low end of the scale, interest in sex differences is again always lowest. In rural schools interest in this topic is expressed by only 13.7% of the teachers.

Data were also analyzed according to the number of science courses that teachers had taken as shown in Table 6. Unfortunately, the wording of this category was vague and it is impossible to know whether teachers interpreted this as high school or college courses. Forty-four percent of the teachers indicated that they took between three and four science courses

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Insert Table 6 about here.

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and 18% had taken over six. Although there appear to be no clear cut patterns of interest that vary according to the number of science courses taken (which may be due to the ambiguity of the category), it is interesting to note that teachers with no more than one science course (5%) have much less interest in cognitive development and learning styles(1) than do teachers who have taken four or more science courses.

Table 7 shows the research interests of teachers according to the number of weeks science is taught each school year.

Insert Table 7 here.

Fifty-five percent of the teachers teach science consistently throughout the school year. Teachers' research interests in this category are somewhat different from those who teach it less frequently. Item 9, printed teaching materials, is not among the top ten items for teachers who teach science consistently but was of greater interest to teachers who taught science for fewer weeks during the year. Item 5, specialized science teachers and facilities also appears in the top ten categories only for teachers who spend 0-9 weeks per year teaching science. Toward the bottom of the list, item 25, science testing and grading, also appears only among this latter group's lowest five interests.

The reseach interests of teachers according to the number of hours of science they teach each week are shown in Table 8.

Insert Table 8 about here.

Once again, there is high interest by teachers in every category in hands-on experiences (3) and in science content of the curriculum (4). Of particular importance is teachers' increasing interest in research on problem solving (11) as the number of hours science is taught increases. In fact, for teachers who give children three or more hours of science instruction per week, problem solving is rated second according to percentages although there is no significant difference between it and the other top four categories.

Conclusions and Implications

The results of this survey indicate that teachers are definitely interested in science education research. All of the teachers rated some priorities with ones or twos. The top ten research priorities of elementary teachers concerning the teaching of science were: "hands-on" experiences, science content of the curriculum, cognitive development and learning styles, problem solving, teaching strategies, gifted children, sequencing of science content, barriers to teaching science, effective printed materials and pupil attitudes. Even items that did not rank in the top ten were perceived by many teachers as being of interest. The demographic data indicated that most teachers were quite experienced and were teaching science two to three hours per week for the entire school year. Forty-two teachers took the time to answer the question posed at the end of the questionnaire about other research topics in which they had an interest. Some of these were repetitious of some of the survey items but others expressed real concerns about such matters as motivation for

independent learning, planning for success and the lack of administrative support for the teaching of science. Several teachers who apparently were using a "hands-on" approach in their classroom questioned its usefulness and were concerned that children were not learning facts and vocabulary or doing science projects.

Results of this study clearly indicate that elementary teachers today are very interested in the usefulness of hands-on experiences in the curriculum (3) and in the science content of the curriculum (4). This is very encouraging in view of the fact that in many schools today the science content is determined by the text that is adopted. It also indicates that teachers are unaware of the research findings of Shymansky, Kyle, and Alport (1983) who found that the hands-on approach was more effective than the traditional approach in promoting such outcomes as knowledge, problem solving skills, and critical thinking.

In the listing of priorities by White et al. in 1980, science educators (including teachers) also expressed interest in hands-on experiences and in science content of the curriculum. In their survey the two topics were listed as fourth and seventh respectively out of 17 response categories according to the frequency with which the group surveyed thought the topics were of importance. It is impossible to tell whether these two topics were ranked higher in this survey because they are of greater interest today or whether the difference is due to sample selection. The sample used by White et al. was about one-fifth the size of this sample, was drawn from more rural and small town populations, and consisted of a mix of administrators, inservice

teachers, and preservice teachers drawn from a seven state area. Their first five research priorities were pre- and inservice education programs (17), contemporary topics (7), teaching strategies (12), hands-on experiences (3), and interdisciplinary teaching of science with mathematics and language arts(21). Three of their top five priorities (items 17, 7, and 21) are not listed among the top ten items of the teachers sampled in this survey. Also of interest are items that were at the bottom of the White et al. survey that now appear near the top of this survey. In particular, item number one (cognitive development and learning styles) is now ranked third from the top in interest as compared to third from the bottom previously. One must interpret this finding somewhat cautiously because of the placement of the item on the survey form. This item was placed first and its popularity might be due to the fact that teachers rated it high before making comparisons with other items on the form. If, on the other hand, teachers are genuinely interested in this topic, this a very positive sign that teachers are concerned about individualizing instruction according to students' needs.

This survey contained 16 items that were obtained from the previous survey and 12 items that were added because it was thought by the NSTA Research Committee that certain contemporary areas were not represented by the original items. It is worth noting that of the 12 items that were added to the survey, three of these were among the top ten research interests of teachers in general and five of them were of least interest to elementary teachers. The three that were among the top ten, problem solving (11) ranked fourth, gifted children (20) ranked sixth, and

barriers to teaching science (27) ranked eighth. This reflects the general public's concern with problem solving and critical thinking in today's schools and the emphasis on gifted education as well as science educators' concern about the lack of science instruction in the elementary schools.

Also of some concern are the items that teachers selected least frequently as being important. Item 24, research on sex differences was the least selected in almost every analysis of the data. It is a well-known fact that fewer girls are attracted to careers in science. One of the causes of this may be that girls do not find science instruction geared to their interests or learning styles. One possible way to increase the number of women in science is to make science more attractive to them. Yet only 21% of the elementary teachers surveyed give sex differences a high priority and only 35% think that role models and science careers(16) are important research priorities. This lack of interest by elementary teachers who are predominately women in these two areas may continue to foster a disinterest in science on the part of young women. Unfortunately, this disinterest in research on sex differences was also found to be the lowest priority of secondary teachers in the study by Gabel et al.(1985).

Also disappointing was the lack of interest by teachers in science misconceptions research. This is one area in which there is great interest by science educators today and more research findings are being published. Perhaps the findings have not filtered through the more technical journals to those of greater appeal to teachers. Research in this area has great promise for

improving science teaching at all levels in that concept learning is emphasized rather than the memorization of facts.

Analysis of the data according to the number of hours that teachers allocate to science instruction also has a message for science educators. Teachers who taught fewer hours of science were more interested in effective print materials, and in specialized science teachers and facilities. One might ask whether this suggests that these teachers rely more on the text, need help from specialists, and are unable to improvise in their own classrooms. It may be a cry for help from these teachers. An encouraging finding is that as the number of hours of science taught increased, teachers showed a greater interest in problem solving. This might imply that these teachers are more secure in dealing with an inquiry approach rather than with the content of the text.

Results of the survey have several important implications for science education. First, they can be used to help science educators plan research that may be of interest to elementary teachers. Second, they can be used by groups such as NSTA who publish research reviews and by colleges and universities that prepare elementary teachers not only is a guide to what is of interest to elementary teachers. but also to identify those areas of research for which dissemination has been lacking. For example, although a number of studies on sex differences and science misconceptions have been published, teachers are probably not aware of their existence and, as a result, the findings have not influenced their teaching. If science education is to improve in this country, science educators and science teachers must work together to insure that what one group is doing is coordinated

with what the other group is doing. There may not be a better place to start than in the area of science education research.

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Table 1
Distribution of Returned Questionnaires of Teachers

Category	n	%
Sex[1]		
Male	62	11.2
Female	488	88.2
Total	553	100.0
Grade Levels Taught[2]		
K	59	10.7
1st	112	20.3
2nd	106	19.2
3rd	95	17.2
4th	96	17.4
5th	99	17.9
6th	64	11.6
Years of Experience[1]		
1 - 5	50	9.0
6 - 10	139	25.1
11 - 15	100	18.1
16 or more	261	47.2
Kind of Community[1]		
Rural	82	14.8
Small Town	241	43.6
Large Town	61	11.0
City	153	27.7
Number of Science Courses[1]		
0 - 1	29	5.2
2	58	10.5
3	117	21.1
4	118	21.3
5	71	12.8
6	31	5.6
6 +	100	18.1
Weeks Science Taught[1]		
0 - 9	29	5.2
10 - 18	86	15.6
19 - 27	115	20.8
28 - 36	307	55.5
Hours per Week of Science[1]		
0 - 1	76	13.7
1 - 2	139	25.1
2 - 3	175	31.6
3 - 4	85	15.4
4 +	76	13.7

1 Percentages do not add up to 100% because some teachers did not check any item in category.

2 Percentages do not add up to 100% because teachers checked more than one item in category.

Table 2
Research Preferences of Teachers of Different Sexes

Ranking	Male		Female		Total	
	Item	%[1]	Item	%	Item	%
Highest Preferences						
1	11	75.8	3	86.0	3	84.6
2	12	75.8	4	82.1	4	80.9
3	3	72.6	1	74.8	1	74.1
4	4	72.6	11	72.3	11	72.7
5	1	67.2	12	71.4	12	71.7
6	2	64.5	20	70.7	20	69.9
7	14	63.9	14	69.5	14	68.8
8	20	63.9	27	65.1	27	64.8
9	5	62.9	9	64.8	9	63.7
10	27	62.9	2	62.5	2	62.5
Lowest Preferences						
24	15	33.9	16	34.7	16	35.5
25	26	32.3	23	32.7	15	33.0
26	23	30.6	15	32.5	23	32.5
27	13	30.6	13	30.6	13	30.8
28	24	19.4	24	21.1	24	21.0

[1] Percentage of teachers rating an item 1 or 2 on priority scale.

[2] Horizontal marks on the vertical lines indicate that the percentage is significantly different at least at the 0.05 level from the percentage given where the line begins.

Table 3
Research Preferencesof Teachers of Different Grade Levels

Ranking	K		1		2		3		4		5		6	
	Item	%[1]	Item	%	Item	%	Item	%	Item	%	Item	%	Item	%
Highest Preferences														
1	3	91.5[2]	3	93.8	3	83.8	3	85.1	4	84.4	4	81.8	4	90.6
2	1	86.4	4	82.7	4	81.0	4	75.8	3	82.3	11	80.6	3	87.5
3	4	77.6	1	82.0	1	73.8	14	70.5	11	75.8	3	77.8	12	81.3
4	8	74.1	20	78.6	14	69.5	11	70.2	20	71.9	20	73.7	11	79.7
5	11	72.4	12	75.0	12	67.6	1	67.4	12	69.8	9	69.7	1	76.6
6	12	72.4	11	73.9	11	67.0	12	67.4	1	68.1	1	69.1	27	74.6
7	14	72.4	14	70.3	2	64.1	20	63.8	27	67.0	12	66.7	20	73.0
8	27	67.2	7	66.7	7	63.1	7	62.8	6	64.9	14	65.3	2	71.0
9	20	64.9	9	66.7	20	62.9	2	59.6	9	60.6	6	64.9	14	67.2
10	7	63.8	21	64.9	27	62.7	6	59.6	14	60.0	5	63.3	17	67.2
Lowest Preferences														
24	15	31.0	16	37.8	23	37.3	23	37.4	13	28.1	25	36.7	23	36.5
25	13	29.3	13	35.7	25	33.0	15	33.7	16	28.1	8	35.4	16	34.9
26	23	27.1	15	34.8	13	28.8	13	33.0	23	26.9	23	35.4	24	30.6
27	25	20.3	23	32.4	15	23.2	16	31.2	15	26.0	13	25.3	8	29.7
28	24	18.6	24	23.2	24	20.4	24	18.7	24	20.2	24	23.5	13	28.1

[1] Percentage of teachers rating an item 1 or 2 on priority scale.

[2] Horizontal marks on the vertical line indicate that the percentage is significantly different at least at the 0.05 level from the percentage given where the line begins.

Table 4
Research Preferences of Teachers of Varying Teaching Experience

Ranking	1 - 5 years		6 - 10 years		11 - 15 years		16 + years	
	Item	%[1]	Item	%	Item	%	Item	%
Highest Preferences								
1	3	88.0	4	87.0	3	91.1	3	81.9
2	1	80.0	3	83.5	4	85.0	4	77.8
3	12	78.0	12	73.7	1	82.0	11	73.0
4	4	74.0	1	73.0	20	73.0	20	71.5
5	21	70.8	11	72.8	11	72.7	14	71.0
6	11	70.0	9	70.4	12	72.3	1	70.8
7	27	68.8	14	68.8	14	64.4	12	69.5
8	20	68.0	20	65.7	2	63.0	27	66.5
9	14	67.3	2	62.8	27	62.4	6	65.4
10	9	66.0	27	62.5	9	61.4	2	61.5
Lowest Preferences								
24	23	44.7	25	35.3	16	35.6	15	34.5
25	15	40.0	13	30.7	23	35.5	16	34.2
26	16	36.0	15	30.4	15	29.7	13	31.9
27	24	33.3	23	30.4	13	28.7	23	30.0
28	13	30.0	24	16.2	24	23.8	24	20.3

[1] Percentage of teachers rating an item 1 or 2 on priority scale.

[2] Horizontal marks on the vertical lines indicate that the percentage is significantly different at least at the 0.05 level from the percentage given where the line begins.

Table 5
Research Preferences of Teachers in Different Types of Communities

Ranking	Rural		Small Town		Large Town		City	
	Item	%[1]	Item	%	Item	%	Item	%
Highest Preferences								
1	3	89.0	3	83.3	4	85.5	3	83.7
2	4	89.0	4	80.0	3	83.9	1	78.1
3	1	72.0	12	76.9	14	72.6	4	77.5
4	12	72.0	11	74.8	20	71.0	11	72.7
5	11	71.6	1	74.2	1	67.2	20	70.2
6	2	71.2	20	73.6	9	64.5	12	67.1
7	27	66.7	14	71.8	11	63.9	27	65.6
8	14	65.9	27	65.3	12	61.3	9	64.5
9	9	63.4	6	64.8	27	60.0	14	64.2
10	22	57.0	7	64.8	2	59.7	6	59.5
Lowest Preferences								
24	25	33.7	15	33.1	16	39.3	16	42.3
25	16	32.9	16	30.8	28	35.6	23	38.0
26	23	30.0	23	30.1	23	26.7	15	35.3
27	15	23.2	13	27.0	13	21.0	13	35.3
28	24	13.7	24	25.3	24	18.3	24	19.3

[1] Percentage of teachers rating an item 1 or 2 on priority scale.

[2] Horizontal marks on the vertical lines indicate that the percentage is significantly different at least at the 0.05 level from the percentage given where the line begins.

Table 6
Research Preferences According to Science Courses Taken

Ranking	0 - 1		2		3		4		5		6		6 +	
	Item	%[1]	Item	%	Item	%	Item	%	Item	%	Item	%	Item	%
Highest Preferences														
1	4	93.1[2]	4	85.0	3	85.5	3	85.9	3	85.9	4	86.7	3	86.0
2	12	93.1	3	83.3	4	79.5	4	81.4	11	84.5	3	83.9	4	78.8
3	14	82.8	1	79.3	11	70.1	1	77.1	1	78.9	1	80.6	1	76.5
4	3	79.3	12	76.3	9	69.0	12	74.1	20	78.9	11	80.6	14	72.0
5	11	75.9	20	72.4	20	67.5	20	71.5	4	74.6	20	77.4	12	70.0
6	9	71.4	9	71.2	14	65.5	11	69.8	14	73.2	12	74.2	2	69.0
7	27	71.4	11	69.6	1	65.2	27	68.1	12	71.8	6	73.3	11	68.3
8	17	69.0	2	69.0	12	63.2	14	67.8	27	69.0	27	70.0	6	66.7
9	1	69.0	22	64.4	27	61.4	21	62.6	2	65.7	2	67.7	20	64.0
10	7,8	65.5	6	64.3	7	54.8	6	59.8	9	62.0	5	66.7	27	63.9
Lowest Preferences														
24	26	42.9	15	38.3	16	35.9	23	33.3	16	36.6	26	39.3	16	35.6
25	23	40.7	13	37.1	15	30.8	16	33.0	15	33.8	15	38.7	15	33.7
26	28	39.3	25	35.6	23	25.0	13	32.2	13	32.4	16	33.3	13	31.7
27	13	34.5	16	29.3	24	25.0	15	25.9	23	28.2	28	27.6	23	30.9
28	24	33.3	24	18.5	13	24.8	24	18.8	24	21.1	24	16.7	24	20.6

[1] Percentage of teachers rating an item 1 or 2 on priority scale.

[2] Horizontal marks on the vertical line indicate that the percentage is significantly different at least at the 0.05 level from the percentage given where the line begins.

Table 7
Research Preferences of Teachers According to Weeks Science is Taught

Ranking	0 - 9		10 - 18		19 - 27		28 - 36	
	Item	%[1]	Item	%	Item	%	Item	%
Highest Preferences								
1	12	86.2	3	80.2	3	86.3	3	85.1
2	4	82.8	4	77.9	1	78.3	4	82.5
3	3	79.3	1	71.8	4	77.8	11	75.1
4	9	75.9	9	70.6	11	71.7	12	73.1
5	20	75.9	14	70.2	12	69.5	1	72.6
6	1	72.4	20	70.2	14	67.2	20	71.0
7	27	72.4	11	69.4	20	66.1	14	70.2
8	7	65.5	2	67.1	9	64.3	27	65.8
9	5	62.1	27	65.9	6	62.9	2	63.0
10	11[3]	58.6	12	63.5	2	60.7	6	62.7
Lowest Preferences								
24	13	41.4	13	31.8	16	34.8	16	35.5
25	23	37.9	16	30.6	15	33.6	23	32.8
26	8	34.5	15	30.6	23	33.0	15	31.2
27	25	31.0	23	28.0	13	31.9	13	29.1
28	24	17.2	24	25.6	24	20.0	24	20.9

[1] Percentage of teachers rating an item 1 or 2 on priority scale.

[2] Horizontal marks on the vertical lines indicate that the percentage is significantly different at least at the 0.05 level from the percentage given where the line begins.

[3] Also 14, 15, 17, 21.

Table 8
Research Preferences of Teachers According to Hours per Week of Instruction

Ranking	0 - 1		1 - 2		2 - 3		3 - 4		4 +	
	Item	%[1]	Item	%	Item	%	Item	%	Item	%
Highest Preferences										
1	3	81.6[2]	3	80.6	3	86.1	3	89.4	3	86.7
2	4	81.6	4	77.5	4	82.7	11	82.4	11	86.3
3	1	73.7	1	73.5	1	73.8	4	81.2	4	82.7
4	9	71.1	12	72.3	11	71.7	12	77.6	1	74.3
5	27	69.7	11	69.6	12	71.4	1	76.2	12	69.4
6	20	69.3	14	68.6	14	70.9	6	74.1	2	68.9
7	12	68.4	20	67.2	20	70.3	20	73.8	20	68.9
8	14	67.1	2	63.7	27	65.5	14	67.1	27	68.1
9	11	57.9	9	63.0	2	64.5	9	65.9	14	68.0
10	17	56.6	27	61.9	7	63.2	7	63.1	6	66.2
Lowest Preferences										
24	16	36.0	16	31.9	23	36.8	23	39.3	8	34.7
25	23	32.9	13	31.4	16	36.4	16	37.6	15	30.7
26	13	31.6	15	29.9	13	31.8	15	34.2	23	27.0
27	25	28.9	23	26.3	15	31.4	13	31.8	13	26.7
28	24	19.7	24	22.4	24	20.1	24	21.4	24	21.9

[1] Percentage of teachers rating an item 1 or 2 on priority scale.

[2] Horizontal marks on the vertical lines indicate that the percentage is significantly different at least at the 0.05 level from the percentage given where the line begins.

Figure 1. Survey Instrument.

National Science Teachers Association Survey of Elementary Teachers on Research Interests.

Please circle the number which best represents your opinion of the topic as a research priority in elementary science education. Questions are given to help clarify the topic.

Priority (High — Low)

1.* Cognitive development and learning styles. 1 2 3 4 5

Questions:
- A. Does matching children's cognitive development to learning materials and activities improve achievement?
- B. Are certain teaching strategies more effective for children of certain learning styles?

2.* Science classroom experiences and pupil attitudes. 1 2 3 4 5

Questions:
- A. Why has there been a decreased interest in science?
- B. What is the relationship between affective and cognitive outcomes?
- C. Do science oriented lessons promote positive group interaction?

3.* "Hands-on" experiences. 1 2 3 4 5

Questions:
- A. Is the "hands-on" approach better than a textbook approach?
- B. How do children with hands-on elementary science background perform in high school science?
- C. Does the hands-on science approach teach the necessary basics of science?

4.* Science content of the curriculum. 1 2 3 4 5

Questions:
- A. What scientific information should be considered basic to elementary school science?
- B. Do children need to know all the content in todays elementary science curriculum?
- C. Should we teach more practical science such as knowledge of drugs, the body, and weather?

5.* Specialized science teachers and facilities. 1 2 3 4 5

Questions:
- A. Do children learn more science when taught by a specialized science teacher than by the regular teacher?
- B. Is science teaching in a special room more effective than in a regular classroom?

Site #:___

Place check marks in any boxes that apply. ☐

SEX: ☐ Male ☐ Female

JOB DESCRIPTION:

☐ Teacher ☐ Dept. Head ☐ Other
☐ Administrator ☐ Science Supervisor or Coordinator

GRADE LEVELS TAUGHT (this year):

☐ K ☐ 1st ☐ 2nd ☐ 3rd ☐ 4th
☐ 5th ☐ 6th ☐ 7th ☐ 8th

YEARS OF EXPERIENCE:

☐ 1 - 5 ☐ 11 - 15
☐ 6 - 10 ☐ 16 or more

KIND OF COMMUNITY IN WHICH YOU WORK:

☐ Rural < 10,000 ☐ Small Town 10,000-75,000
☐ Large Town 75,000-150,000 ☐ City > 150,000

NUMBER OF SCIENCE COURSES TAKEN:

☐ 0-1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 6+

NUMBER OF WEEKS PER YEAR YOU TEACH SCIENCE:

☐ 0-9 ☐ 10-18 ☐ 19-27 ☐ 28-36

NUMBER OF HOURS PER WEEK YOU TEACH SCIENCE:

☐ 0-1 ☐ 1-2 ☐ 2-3 ☐ 3-4 ☐ 4+

Priority (High — Low)

6.* Balance of concept learning and process skills. 1 2 3 4 5

Questions:
- A. How do the outcomes of a process-centered approach and a content-centered approach differ?
- B. Is there a need to learn more facts along with the investigative approach?
- C. What are the effects of programs that combine process and content?

* Item contained on survey instrument of White et al.

Priority
High Low

21.* Interdisciplinary teaching of science with mathematics and language arts. 1 2 3 4 5

Questions:
A. Does increasing children's math skills increase their science achievement and vice-versa?
B. Can children's reading and language arts skills be enhanced through the teaching of science?
C. Can science be taught effectively through an interdisciplinary approach?

22.* Teacher determined versus student determined activities. 1 2 3 4 5

Questions:
A. How much direction for children is best in science teaching?
B. How valuable are teacher demonstrations when compared to experiments done by children?
C. Which is more beneficial, teacher directed science lessons or informal experiences that are part of play experiences?

23. Science fairs. 1 2 3 4 5

Questions:
A. How does participation in science fairs affect children's performance in science classes?
B. Do children who participate in science fairs understand the process of science better than children who do not participate in them?
C. What factors, such as science performance, parental occupation, etc., influence participation in science fairs?

24. Sex differences. 1 2 3 4 5

Questions:
A. Do children of different sexes learn science better using different instructional strategies?
B. Do children of different sexes learn certain content (concepts) better than others?
C. Do boys have more favorable attitudes toward science than girls?

Priority
High Low

25.* Science testing and grading. 1 2 3 4 5

Questions:
A. Can valid tests be developed to test the effectiveness of both process and content instruction in science?
B. Can evaluation of children's achievement in science affect future learning?
C. Are procedures such as interviewing children and using concept maps more effective tools than ordinary tests?

26.* Disadvantaged children. 1 2 3 4 5

Questions:
A. How can visually or physically handicapped children participate in all areas of science?
B. What science topics and methods are most suitable for teaching inner-city children?
C. What are effective methods for teaching science to non-English speaking pupils?

27. Barriers to teaching science. 1 2 3 4 5

Questions:
A. Do teachers who have access to science materials plan more hands-on science activities for their classes?
B. Is material availability or teacher self-concept more important in determining the degree to which science is emphasized?
C. What are the barriers, such as lack of space, materials, knowledge, to teaching science?

28. Computer assisted instruction. 1 2 3 4 5

Questions:
A. How effective are computers in teaching science to children?
B. What types of computer programs in science are most effective for teaching science to children?

Are there other research topics that should be considered that would help you in your teaching? If so, please list them in the space provided.

Priority
High Low

7.* Contemporary topics. 1 2 3 4 5

Questions:
A. How can a primary child learn about energy and conservation?
B. Can effective materials be developed on the human life cycle?
C. How can we teach environmental science in grades 1-6?

8.* Science learning centers. 1 2 3 4 5

Questions:
A. What is the value of science-oriented discovery centers?
B. Can learning centers be effective for large groups?

9.* Effective printed materials. 1 2 3 4 5

Questions:
A. Can elementary science be taught in short units?
B. How can readability of science materials be modified?
C. How does the content of science texts compare to the content of standardized science tests?

10. Rote versus meaningful learning. 1 2 3 4 5

Questions:
A. Do advance organizers facilitate meaningful learning?
B. Does concept mapping encourage meaningful learning?
C. What instructional strategies encourage meaningful learning?

11. Problem Solving. 1 2 3 4 5

Questions:
A. What variables make problem solving meaningful to children?
B. What instructional strategies help children solve problems successfully?
C. Are there differences in the ways that children solve problems than adults solve them?

12.* Teaching strategies. 1 2 3 4 5

Questions:
A. What activities are best suited for each process skill at various grade levels?
B. What methods of teaching are most effective for learning science concepts at various grade levels?
C. Can science be taught effectively through television?

13. Misconceptions. 1 2 3 4 5

Questions:
A. What kinds of misconceptions do children hold on various science topics?
B. How do misconceptions originate; how can they be reduced?
C. What cognitive/affective factors are responsible for the aquisition/elimination of misconceptions?

Priority
High Low

14.* Sequencing of science content. 1 2 3 4 5

Questions:
A. Can we develop continuity of concept formation from one grade level to another?
B. Do certain concepts need to be taught before others?
C. How effective is a spirally organized science curriculum?

15. Language difficulties. 1 2 3 4 5

Questions:
A. What is the impact of various levels of English proficiency on science achievement?
B. Does the teaching of science improve English proficiency?

16. Role models and science careers. 1 2 3 4 5

Questions:
A. Do children who are exposed regularly to visiting scientists express a greater interest in science?
B. Are retired scientists effective in working with children to influence interest in science?

17.* Pre-and inservice education programs. 1 2 3 4 5

Questions:
A. What are the characteristics of effective inservice and preservice science programs for teachers on the elementary level?
B. What is the relationship between a teacher's training and the performance of pupils?

18. Self Concept. 1 2 3 4 5

Questions:
A. What instructional strategies enhance children's self concept?
B. What is the effect of rote versus meaningful learning on children's self concept?
C. Do children with a higher self concept achieve better in science?

19. Slow learners. 1 2 3 4 5

Questions:
A. How can the long term and the short term achievement of slow learners be increased?
B. Does improving a child's self concept increase long and short term achievement?
C. What is the relationship between verbal skills of slow learners and science concept attainment?

20. Gifted children. 1 2 3 4 5

Questions:
A. Is there a relationship between creativity and science achievement?
B. What factors foster high levels of creativity?
C. What teaching strategies are best for teaching science to gifted children?